PolyGard® PTB821160

Portable Carbon Dioxide Meter including Temperature Measurement

User Manual

September 2008

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Portable Carbon dioxide (CO_2) meter with temperature measurement

1 Description

The portable PolyGard® CO_2 meter PTB821160 is designed to measure the carbon dioxide concentration and temperature in the surrounding air. The two values are displayed on the large illuminated LCD simultaneously. An audible alarm is included. The integrated gold-plated sensor is based on state-of-the-art non-dispersive infrared technology. The built-in data output (RS232) makes it simple to log data. The instrument is delivered with a hard carrying case, batteries and manual.

2 Application

The portable instrument is used in residential, commercial and industrial ranges for diagnosing ventilation and indoor air quality by measuring the carbon dioxide concentration. Poor indoor air quality is considered unhealthy because it causes tiredness, loss of ability to concentrate, and even illness. IAQ monitoring and survey, especially on CO_2 level and air ventilation become widely applied in public areas such as offices, classrooms, factories, hospitals and hotels.

It is also applicable for measurements in incubators, greenhouses, mushroom farms, etc. where correct levels are essential.

3 Features

The meter contains the following features:

- State-of-the-art non-dispersive infrared (NDIR) technology
- Measuring range 0 - 2000 ppm
- Data output RS232
- Great liability and long-term stability
- Audible alarm
- Internal batteries (capacity: more than 24 hours)
- Internal automatic self-diagnostic function
- Easy calibration
- Large, clear LCD display (temperature, concentration) for simultaneous display of current CO_2 concentration and temperature
- Display of TWA (8 hours), STEL (15 minutes), minimum, maximum and average values
- Pocket-sized– 209 x 70 x 58 mm
- Extremely light – only 180g (without batteries)
- RS232 software: Windows 95/98/NT/ME/2000/XP software (option)
- Special cable for digital interface RS232 (option)
- Adapter 9 V / 100-240 VAC (Option).

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4 Functional Description

4.1 Power Supply

The meter is powered by either 4 AA batteries or a DC adapter (9V/1A output).

- Install the batteries into the battery compartment on the rear and make sure that they are in correct polarity and good contact.
- When an adapter is used, it will cut off the power supply from batteries. The adapter cannot be used as a battery charger.
- When the battery voltage gets low, and "Lob" will appear on the display. Additionally the beeper starts to sound. In case of insufficient voltage, the CO_2 sensor is not able to work; so it peeps to indicate a failed CO_2 measurement. The readings won't be displayed.
- Press any key but SET to stop the beeping.
- Please replace with fresh batteries or connect with an adapter.

4.2 LCD Display

Symbols:

- TWA Time weighted average value (8 hours)
- STEL Short-term exposure limit (15 min. average value)
- HOLD Readings are freezed unchanged.
- MIN/MAX Minimum/ maximum readings
- Low battery indicator
- AIR Air temperature
- °E (C/F) Celsius / Fahrenheit

4.3 Keypad

- SET
  Turns on and off the meter
  Enters setup mode.
  Sets as non-sleep mode with HOLD.
- CAL Esc
  Exits setup page/ mode.
  Enters CO_2 calibration with MODE.
- HOLD
  Freezes the current readings.
  Cancels the data hold function.
- MODE
  Activates or cancels the backlight.
  Selects unit or increases a value in setup.
- DP/WBT
  Selects unit or decreases a value in setup.
- MIN/MAX/AV
  Activates MIN, MAX, STEL, TWA function.
  Saves and finishes settings.

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5 Operation

5.1 Power On / Off

- Press SET to turn the meter on and off.
- At power up, it emits a short beep and performs a 30 seconds countdown for the meter warm up, then enters normal mode with current CO_2 level and temperature readings displayed.

5.2 Measurements

The meter starts measurement when power on and updates the readings every second. In case of operating environment change (e. g. from high to low temp.), the sensor needs 30 seconds to respond.

Attention: Do not hold the meter close to faces in case exhalation affects CO_2 levels.

5.3 Air Temperature

The ambient air temperature is displayed down left.

5.4 Data Hold

Press the HOLD button to freeze the readings, “HOLD” is displayed on the left top of the LCD. All current readings are kept unchanged, except STEL and TWA. Press the HOLD button again to cancel the hold function.

5.5 Backlight

Hold down the MODE button for more than 1 second to activate and cancel backlight function.

5.6 MIN, MAX, STEL, TWA

In normal mode, press the MNX/AV button to see the minimum, maximum, and weighted average readings. With each press on the MNX/AV button, it displays MIN, MAX, STEL and TWA in sequence and returns to normal mode.
In MIN and MAX modes, it shows the minimum and maximum readings of CO_2 on the main display and of air on the lower display.
In STEL and TWA modes, the main display shows the weighted average of CO_2 readings for the past 15 minutes (STEL) and 8 hours (TWA). The lower display is the current air temperature.

Note:

1. If the meter is turned on for shorter than 15 minutes, the STEL value will be the weighted average of readings taken since power on. Same for TWA values appear before 8 hours.
2. It takes at least 5 minutes to calculate STEL and TWA, The display shows “- - - -” during the first 5 minutes from power on.
3. While all readings are held unchanged, STEL and TWA will keep updating every 5 minutes.

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5.7 Alarm

The meter features an audible alarm to give warnings when CO_2 concentration exceeds the limit (see P1.0 in setup for setting alarm threshold).It emits beeps (about 80dB) when CO_2 level goes over the set value and stops when any key (but the SET button) was pressed or readings fall below the set value .It beeps again when the value goes over the limit. Restart the meter if the beeper can't be stopped.

6 Auto Power Off

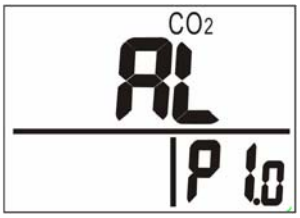
The meter turns off automatically after 20 minutes of inactivity. To override the function, hold down the SET and the HOLD button for 2 seconds to turn on the meter until "n" appears.
NOTE: Auto sleep function will be disabled during calibration mode.

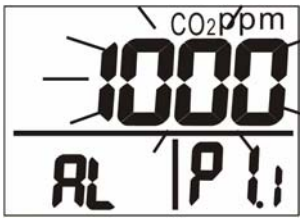
7 Setup

Hold down the SET button in normal mode for more than 1 sec. to enter setup mode. To exit setup, press the CAL/ESC button in P1.0 or P3.0 and it returns to normal mode.
Note: P2.0 is not applicable in these models but for future model with CO and CO_2 measurement.

7.1 P1.0 CO_2 Alarm

When entering setup mode, P1.0 and "AL" are displayed on the LCD. Press the MNX/AV button to go into P1.1 for setting the CO_2 alarm threshold. The current set value will be blinking on the LCD.





Press the MODE button to increase the value or the DP/WBT button to decrease. Each press tunes 100 ppm and the alarm range is from 100 to 9900 ppm. When the preferred alarm value is set, press the MNX/AV button to save the settings or the CAL-ESC button to return to P1.0 without saving.

7.2 P3.0 Temperature Range

Press the MODE button or the DP/WBT button in P1.0 to access P3.0 for setting up temperature scale (see fig.). Press the MNX/AV button to access to P3.1 with blinking °C or °F current set on the lower left display.

To switch °C or °F, press the MODE button and the DP/WBT button. Then press the MNX/AV button to save the setting or the CAL-ESC button to return to P3.0 without saving.

8 CO_2 Calibration

The meter defaults to be calibrated manually in the ambient air where CO_2 concentration is around 400 ppm.

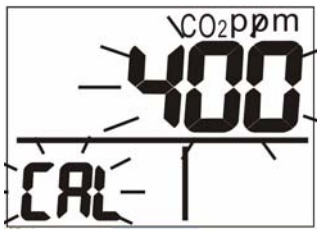
Caution:
Do not calibrate the meter in the air with unknown CO_2 concentration. Otherwise, it will be calibrated as 400 ppm by default and leads to inaccurate measurements.

8.1 Calibration Site

It is suggested to calibrate the CO_2 sensor in fresh outdoor air that is well ventilated and better in sunny weather. Do not calibrate the meter in places crowded with people or in places with high CO_2 concentration such as ventilating outlets or fireplaces.

8.2 Procedure

Place the meter in the calibration site. Turn on the meter and hold down the CAL-ESC and the MODE buttons simultaneously to enter the CO_2 calibration mode. 400 ppm and “CAL” are blinking on the LCD while performing calibration.



Wait about 10 minutes until the blinking stops and the calibration is completed automatically and back to normal mode.
To abort the calibration, turn off the meter at any time.

Note:
Ensure that the batteries are with full voltage during the calibration to prevent from interruption or failed calibration.

9 Troubleshooting

Trouble	Solution
Can’t power on	Press SET button for more than 0.3 seconds and try again.
	Check whether the batteries are in good contact and correct polarity.
	Check whether the adaptor is well plugged.
Fixed readings	Check whether data hold function was activated (HOLD icon at the left top)
Slow response	Check whether the air flow channels on the rear were blocked.

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Error messages	
E01	CO_2 sensor damaged
E02	The value is under range.
E03	The value is over range.
E07	Too low voltage to measure CO_2. Replace batteries or use an adaptor.
E17	Retry CO_2 calibration
E31	Temperature sensor damaged

10 PC Connection

The meter can do PC link for on-line logging and data analysis via RS232 interface and software.
The protocol is as follows.
A. 9600 bps, 8 data bits, no parity
B. Format (ASCII)
Cxxxxppm: Txxx,xC(F) LRC CRLF
Description: $CO_2: Air LRC CRLF

11 CO_2 Levels and Guidelines

The following are excerpts from ANSI/ASHRAE addendum standard 62.1-2004:

Enforceable and/or regulatory levels:

- **OSHA** (Occupational Safety and Health Administration) – 5000 ppm
- **MAK** (Maximale Arbeitsplatz Konzentration – maximum allowable concentration) – 5000 ppm or 10000 ppm (1 h)

Non–enforced guidelines and reference levels:

- **Canadian** – 3500 (long-term)
- **NIOSH** (U.S. National Institutes of Health) - - 5000 ppm or 30000 ppm (15 min.)
- **ACGIH** (American Conference of Governmental Industrial Hygienists) – 5000 ppm or 30000 ppm

Notes:

TWA (Time Weighted Average) value stands for the average carbon dioxide level exposure during 8 hours (working day) is 5000 ppm/ 5 days.

STEL (Short-Term Exposure Limit) value shows the last 15 minutes CO_2 concentration and is 30,000 ppm.

ASHARE Standard 62-1989, Sec 6.1.3: Comfort (odour) criteria are likely to be satisfied if the ventilation rate is set so that 1.000 ppm of CO_2 is not exceeded.

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12 Specifications

Electrical	
External supply (option)	Plug in transformer
Internal battery	4 x AA batteries
Battery capacity	> 24 hours
Gas Sensor Performance	
Detected gas	CO_2
Sensor element	Non-dispersive infrared sensor with gold-plated optical cell, diffusion
Measuring range	0 – 2000 ppm
Extended range	2001 – 9999 ppm (accuracy not specified)
Accuracy at NTP (25°C)	± 5% of reading or ± 75 ppm
Sensor life expectancy	> 15 years
Response time	Approx. 30 sec
Pressure dependence	+ 1,6% reading increase per kPa deviation from normal pressure
Calibration	Manual calibration with fresh air
Temperature Sensor Performance	
Measuring range	0 °C to + 60 °C
Accuracy	± 0,5 °C
Logger and Software	
Digital interface	Special cable RS232 (option)
PC software	Windows 95/98/NT/ME/2000/XP software (option)
Operating Environment	
Humidity range	0 – 95 % RH non-condensing
Working temperature	0 °C to + 50 °C
Storage temperature	- 20 °C to + 70 °C
Visualisation	
Numerical Liquid Crystal Display	LCD
Operation	6 push-buttons
Alarm sound level	80 dB
General performance	
Self-diagnostics	Complete power/sensor/internal checks
Power-up time	< 30 sec. (full specs < 15 minutes)
Enclosure material	ABS/PC blend
Dimensions (H x W x D)	209 x 70 x 58 (mm)
Weight	Approx. 180 g
Approvals/Listings	
	EMC Directive 89/336/EEC
Warranty	1 year/material

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13 Notes and General Information

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions. The PolyGard® devices must be used within product specification capabilities. The appropriate operating and maintenance instructions and recommendations must be followed.

Due to on-going product development, MSR reserves the right to change specifications without notice. The information contained herein is based upon data considered to be accurate. However, no guarantee is expressed or implied regarding the accuracy of this data.

13.1 Intended Product Application

The PolyGard® devices are designed and manufactured for control applications and air quality compliance in commercial buildings and manufacturing plants.

13.2 Installers' Responsibilities

It is the installer's responsibility to ensure that all PolyGard® devices are installed in compliance with all national and local codes and OSHA requirements. Installation should be implemented only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70). It is also essential to follow strictly all instructions as provided in the user manual.

13.3 Maintenance

It is recommended checking the PolyGard® devices regularly. Due to regular maintenance any performance deviations may easily be corrected. Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools.

13.4 Limited Warranty

MSR-Electronic-GmbH warrants the PolyGard® device for a period of one (1) year from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, MSR-Electronic-GmbH will repair or replace the product at their own discretion, without charge.

This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise. The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned. The above warranty is in lieu of all other express warranties, obligations or liabilities.

This warranty applies only to the PolyGard® device. MSR-Electronic-GmbH shall not be liable for any incidental or consequential damages arising out of or related to the use of the PolyGard® devices.

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